

MORTGAGE PRODUCT CHOICE IN AUSTRALIA:

The impact of market stress

MARIA YANOTTI, PhD candidate Economics and Finance, Tasmanian School of Business and Economics, University of Tasmania

MARDI DUNGEY, Professor of Economics and Finance, Tasmanian School of Business and Economics, University of Tasmania, CFAP, University of Cambridge and CAMA, Australian National University

This paper presents evidence on the impact of the global financial crisis on the selection of mortgage products by borrowers. Using a sample of bank-originated mortgage applications between January 2003 and May 2009, we show that the advent of the crisis results in significant changes in the effects of a number of borrower characteristics on mortgage product choice. These changes are consistent with the hypothesis that risks are transferred to the borrower at a discounted price during the crisis period. 'Honeymoon' products became increasingly popular and more accessible during the crisis, offering the applicant higher discounts on the variable interest rate. Also, variable and fixed-rate mortgages are both taken up by relatively low-risk applicants. An earlier version of this paper was presented to the 2014 Australian Centre for Financial Studies' Melbourne Money and Finance Conference.

The events of 2007–08 prompted massive changes in international mortgage markets. In particular, restricted institutional access to international credit was translated into a contraction in the Australian housing finance supply, while increased uncertainty about future economic growth and employment led to a contraction in housing debt.¹ Policy makers responded with reduced interest rates and a suite of fiscal incentives to stimulate the housing market, particularly new housing construction.²

This paper reviews the evidence of changes in the Australian market for owner-occupier mortgages as a result of the global financial crisis (GFC). Unsurprisingly, the number of mortgages approved fell dramatically in the period immediately after the GFC, and the composition of the mortgage product mix altered substantially.³ This is undoubtedly the result of the interactions of both borrower and lender decisions. Using a detailed dataset on bank-originated mortgage applications for individual households between January 2003 and May 2009, we are able to provide a picture of the changing environment in the mortgage market — although we are not able to untangle whether supply or demand effects are dominant in these changes.

During the GFC, the number of short-term fixed-rate mortgages (SFRMs) in the market fell dramatically following a sharp increase in their cost relative to other mortgage products. However, the drop in the proportion of SFRMs in the market was almost balanced by a considerable increase in the number of 'honeymoon' mortgages (HMs) offering a higher discount over the standard variable-rate mortgage (VRM) than prior to the GFC. By distinguishing two periods — a 'credit expansion' period prior to September 2008 and the period during which the effects of the GFC were felt in Australia from September 2008 to May 2009 — we show that the lenders reacted by tightening credit for housing, and borrowers reacted to the increased uncertainty in economic conditions.

First, we provide a short overview of the products available in the Australian mortgage market, and the changing face of this market prior to and during the GFC. We then draw on a rich bank-originated dataset for owner-occupier home loans to show how borrower characteristics influenced mortgage choice during the credit expansion years prior to the GFC, and contrast this with the observed changes in these choices by similar households during the GFC.

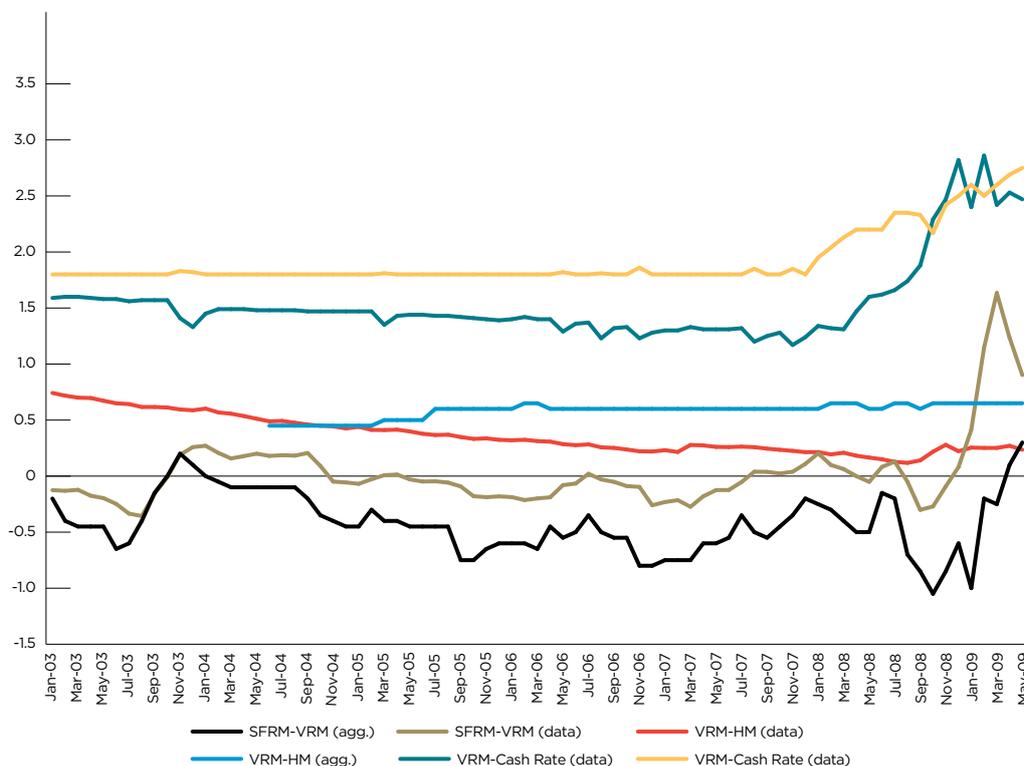
Mortgage market overview

In March 2014 Australian banks held A\$15,417,915,000 in owner-occupier housing finance commitments – around 93 per cent of all housing finance commitments held in Australia.⁴ These mortgages represent an important source of capital for Australian banks, which tend to hold most of the mortgage debt on balance sheet. These banks, and other authorised deposit-taking institutions, are regulated by the Australian Prudential Regulatory Authority (APRA), which follows and implements the Basel Committee capital standards.⁵

Australian borrowers hold mainly variable-rate mortgages (VRMs), which adjust at the discretion of the lender and have relatively low costs associated with early termination. Before 2008, mortgage rates for VRMs followed the Reserve Bank of Australia's (RBA's) cash rate, with an approximate spread of 180 basis points.⁶ With the onset of the financial crisis, mortgage interest rates dissociated from the cash rate, and moved more closely with lender funding costs. In 2014, SFRMs – loans where the interest rate is fixed for an average period of three to five years, and with high early termination costs – represent around 15 per cent of the mortgage market.⁷ (Mortgages with a long-term fixed interest rate, such as the 30-year FRM offered in the US, do not exist in Australia.) Borrowers can also access discounted variable-rate mortgages, known as 'honeymoon' mortgages (HMs), which offer a discount on the variable-rate for a short, fixed period of time. While the loan-to-value ratios (LTVs) for these mortgages can reach as high as 95 per cent with private mortgage insurance, APRA (2008) reports an average LTV of 67 per cent in Australia for 2006. Other less popular owner-occupier mortgage products are interest-only loans, split mortgages and home equity loans. Most mortgages are fully documented and full-recourse. Low-documentation loans represent less than 10 per cent of all mortgage loans, and are offered to borrowers who self-report their financial position.⁸

Figure 1 shows the evolution of the different mortgage contract interest rates for the sample period. It shows a dramatic increase in the spread between SFRM and VRM rates, and the slight increase in the discount offered to HM borrowers during the GFC.⁹

FIGURE 1: Housing loan interest rate spread



Source: RBA, *F1 Interest Rates and Yields – Money Market, and F5 Indicator Lending Rates (agg.)*, and *Researcher's data (data)*.

The period of the GFC coincided with a number of events associated with tightening international credit conditions, including interventions by the European Central Bank in August 2007, the failure of Lehman Brothers in September 2008 and the lead-up to the Greek sovereign debt crisis (Gorton and Metrick 2012). We distinguish two periods of relevance to Australian markets: a 'credit expansion' period prior to September 2008; and the impact of the GFC period in Australia from September 2008 to May 2009. We choose September 2008 as the cut-off, as it contains the Lehman crisis and the first responses by the Australian domestic policy makers to the unfolding international turmoil.¹⁰

Banks faced a substantial increase in lending costs from mid-2007 to early 2009. Deans and Stewart (2012, Graph 1) show that before mid-2008 Australian banks funded their mortgage debt with deposits (40 per cent), short-term wholesale debt (32 per cent), and long-term debt (18 per cent). During the GFC period their funding composition relied more heavily on domestic deposits (over 45 per cent) and long-term debt (over 20 per cent),¹¹ while the share of short-term debt (25 per cent) and securitisation (7 per cent)¹² as sources of funds decreased. This change in funding strategy reflects an intention to reduce interest rate risk and rollover risk (the risk involved in replacing maturing wholesale debt).

The reactions of mortgage originators and lenders to the international credit contraction, and that of borrowers to the uncertain environment, are evident in four key features of the Australian mortgage market: (1) the interest rate on SFRMs rose faster and became larger than the interest rate on VRMs after September 2008; (2) the proportion of SFRMs in the market dropped dramatically from the beginning of 2008; (3) the discount on HMs slightly increased in August 2008; and (4) the proportion of HMs in the market offset the decrease in SFRMs. In addition, Stewart et al. (2013) suggest that some lenders revised their minimum serviceability criteria for assessing new loan applications after the GFC.

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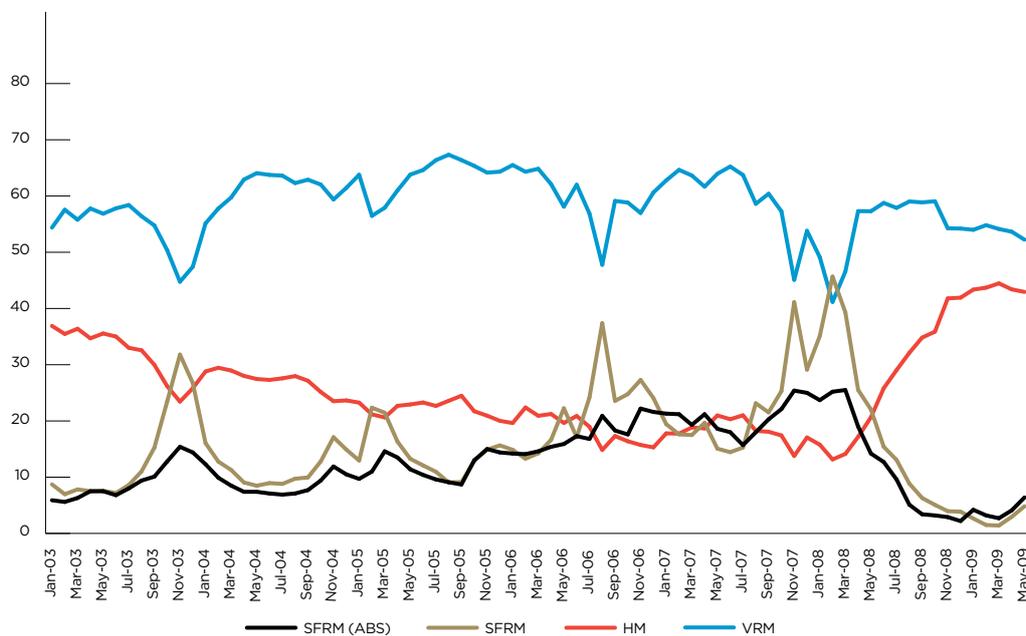
As shown in Figure 1, the price of SFRMs changed dramatically around mid-2008 in the bank-originated data. Between January 2003 and August 2008, SFRMs were on average 40 basis points 'cheaper' than VRMs. During September 2008 to May 2009, SFRMs were on average 530 basis points more 'expensive' than VRMs — a 570 basis points increase from the previous period. As a result, as shown in Table 1 and Figure 2, borrowers who were taking SFRMs before the impact of the GFC began instead to take variable-rate mortgages during the GFC — with the switch focusing mainly on HMs, but also VRMs.

The proportion of SFRM applications in the crisis period dropped dramatically as shown in Figure 2. While SFRMs represented 25.5 per cent of all residential mortgages in March 2008, this share fell dramatically to 2.2 per cent in December 2008. During the period between September 2008 to May 2009, an average of 4 per cent of all residential mortgages were SFRMs.¹³ A rational response of mortgage originators to increasing funding costs is to offer mortgages which provide a lower interest rate with associated low interest rate risk for the lender. This suggests lenders may have been offering more VRMs in this period, with relative terms to induce low-risk borrowers towards VRM and HM products. This strategy includes, as shown in Figure 1, raising the cost of SFRM loans to deter borrowers, and increasing the discount on HMs. Mortgage applicants reacted to the new market prices by selecting a greater proportion of HMs and fewer SFRMs, even if they preferred certainty in their repayments in a low-interest rate, uncertain environment. The discount on HMs was on average 570 basis points during the credit expansion; after August 2008, the discount increased to an average of 640 basis points.¹⁴

In addition, the behaviour of first-time home buyers during the two periods is of interest. First home buyers in Australia represent 13 per cent of all buyers with housing finance commitments in 2014.¹⁵ In July 2000, the Commonwealth Government introduced a cash grant scheme to support first home buyers into home ownership as an offset to the goods and services tax introduced at that time.¹⁶ Between January 2000 and August 2008, on average 18 per cent of mortgage borrowers were first-time home buyers – 3 per cent less than during the previous decade. The boost to the first home owner grant schemes in September 2008 raised incentives for home ownership, and the average proportion of first home buyers between September 2008 and May 2009 rose to 27 per cent, reaching a peak of 31.4 per cent in the last month of that period.

Overall, the traditional concentration of the Australian banking system around four major banks has increased since the GFC. Between January 2000 and August 2008 banks held on average 78 per cent of all housing finance commitments (both in number and in value), while from September 2008 to March 2014 the average was as high as 91 per cent.¹⁷ Although return on equity for Australian banks has declined following the GFC, it remains above that of large banks in the US, UK, Japan and the euro area; see Stewart et al. (2013, Figure 15).

FIGURE 2: Proportion of loans by type of mortgage product



Sources: ABS, Housing Finance Commitments 5609.03, and researcher's data.

Results from loan-level household data

We now explore the shift in mortgage product selection more formally with a unique data set containing anonymised information on mortgage applications for owner-occupier home loans originated and processed by a large Australian bank for the period between January 2003 and May 2009. The data include borrower characteristics, verified financial data, demographics, and mortgage terms and characteristics.

Over half of owner-occupier home loan borrowers in the dataset take VRM products. Table 1 presents a brief overview of the mortgage product characteristics during the credit expansion period (pre-GFC) and the period of impact of the GFC in Australia (GFC). During the credit expansion period the share of borrowers applying for VRMs was 59 per cent, for SFRMs it was 23 per cent, and for HMs it was 18 per cent. The data reveal the drastic reduction in SFRMs in the market during the GFC period and increase in HM applications consistent with the national data. However, while terms and conditions for VRMs and HMs changed between the two periods,

this was not the case for SFRMs. The average loan amount, LTV, debt-servicing ratio, and borrower characteristics such as average income, wealth and liquid assets are not statistically different between the pre- and crisis periods for SFRMs. This suggests that borrowers stopped applying for SFRMs not because their terms changed but mainly because of the change in the interest rate.

The mean loan size, LTV, debt-service-ratio, borrower's gross monthly income, net wealth and liquid assets associated with VRMs and HMs differ significantly during the crisis period relative to their values before the crisis. HMs became more accessible, offering on average lower LTVs and lower debt-to-service-ratios. Interest rates for all mortgage products changed significantly across the two periods.

TABLE 1: Average mortgage and borrower characteristics during the pre-crisis and crisis periods

	Pre-GFC (Jan 03–Aug 08)			GFC (Sep 08–May 09)		
	VRM	HM	SFRM	VRM	HM	SFRM
Proportion of loans	58.7%	22.9%	18.4%	54.9%	41.5%	3.6%
Loan value	\$226,840	\$165,387.2	\$189,044.2	\$254,932	\$176,642.6	\$188,138.2
Rate	7.16%	6.67%	7.34%	6.86%	6.50%	7.49%
LTV	62.29%	63.38%	66.48%	63.04%	62.23%	65.68%
DSR	45.53%	40.44%	46.20%	47.81%	39.29%	46.94%
Monthly Income	\$7,428.25	\$5,422.42	\$6,707.77	\$8,370.96	\$5,798.51	\$6,781.09
Wealth	\$420,959.9	\$311,462.5	\$331,791.5	\$454,231.5	\$316,504.8	\$321,411.8
Liquid Assets	\$56,336.58	\$33,492.2	\$44,081.7	\$63,297.24	\$37,586.07	\$42,283.25

Note: Averages. All monetary values in the paper are expressed in \$A2006 Q1 terms. Averages in grey are not statistically significantly different (at a 5% significance level) between the two sub-samples.

To further examine how the impact of the GFC affected the mix of mortgage products taken by Australian households we predict the probability of observing a mortgage product type conditional on mortgage costs and terms, market indicators, and individual borrower characteristics.¹⁸ Our analysis is based on over half a million mortgage applications processed between January 2003 and May 2009.

Consider a benchmark applicant who is a 40-year-old, single, salary-earning employed male, without a co-applicant and with no dependents, and who is a repeat buyer (not buying his first home). His average income is \$82,032 p.a. (\$6,836 per month), and he has outgoings of \$2,897 per month. He begins his mortgage application process with funds towards a deposit of \$48,851 and net wealth of \$379,479. (All monetary values are expressed in \$A2006 Q1 terms.)

Prior to the GFC, this applicant is most likely to choose a VRM mortgage (predicted probability of 59.1 per cent). He would be influenced away from this decision by having an increased number of dependents, being in a less stable employment category (such as skilled or unskilled trade, and agricultural occupations), being under 30 years of age, or having a lower income. All of these aspects increase the applicant's exposure to income risk, and he is more likely to choose an alternative product such as a HM or SFRM to gain reduced initial payments or certainty over those payments.

Female applicants are more likely to choose a product with greater payment certainty. This aspect remains even after we have controlled for income, family size and occupation category, and may be aligned with the existing evidence for financial risk aversion among women; see Barber and Odean (2001) and Borghans et al. (2009). Young families also seek to minimise initial costs and payments via HMs, and this propensity increases with the number of dependents and the presence of very young children; similarly, borrowers under 40 years of age are more likely to take FRMs. These applicants have characteristics that reveal risk aversion and income or wealth constraint consistent with their revealed behaviour in taking FRMs and HMs.

On the other hand, more established families, who often have greater wealth and income – and income stream guarantors through a spouse or a co-borrower – are more likely to opt for a VRM, which provides them with early payment flexibility, and larger access to the existing equity in their house for other purposes. These households take larger loans, are more mobile, and appear to be more financially savvy – they occupy professional and management positions, or are self-employed. In the pre-GFC period, these characteristics significantly influence the probability of the applicant in taking a particular mortgage product. These results are completely consistent with the existing theory on mortgage choice, such as developed in Campbell and Cocco (2003).

However, during the GFC period, a number of changes occur. In this period, the proportion of SFRM applications dropped dramatically. Interest rates on mortgages declined, but not as fast as the cash rate. The spread between interest rates charged on fixed and variable mortgages in this period amplified, with SFRMs having higher interest rates than VRMs. Thus, the drop in the proportion of SFRM applications we observe is consistent with a cost-based view of mortgage selection. During the GFC, the discount offered on HMs becomes a significant explanatory of mortgage choice, consistent with lenders offering higher interest rate discounts for these products.

To illustrate more clearly the effects of the GFC period on mortgage choice, we consider five representative borrowers, and estimate their predicted probability of choosing the three mortgage products (VRM, SFRM and HM). Table 2 presents the benchmark 40-year-old, salary-earning, childless, single male for both sample periods as discussed above. The second group is an income-constrained young male applicant who is a first home buyer – he has lower than average income and higher than average expenses. Table 2 shows that he is less likely to take a VRM than the benchmark applicant in both periods, but this probability increases during the GFC. The third group comprise female applicants with dependent children under age five, with lower than average income, and an unskilled occupation category. This applicant is far more likely to prefer a non-VRM product, but the crisis reduces her ability to access those mortgages.

TABLE 2: Predicted probabilities

	VRM		SFRM		HM	
	Pre-GFC	GFC	Pre-GFC	GFC	Pre-GFC	GFC
A: 40-year-old male, employee, single, no dependents	59.1%	49.9%	16.1%	33.8%	24.8%	16.4%
B: First home buyer, income and wealth constrained	53.5%	40.9%	18.8%	36.2%	27.7%	23.0%
C: Female applicant, young dependents, low income, unskilled	41.9%	36.7%	18.8%	40.3%	39.3%	22.9%
D: Professional, 30- to 40-year-old, single, no dependents, repeat buyer, mobile	73.4%	66.7%	16.2%	27.0%	10.3%	6.3%
E: Established families, older children, co-borrower, married, higher wealth	63.3%	55.0%	14.9%	32.2%	21.8%	12.7%

The changing lending criteria and borrower behaviour are reflected in the household application data. Consider again our 40-year-old employed male benchmark. He is now less likely to take a VRM product than during the credit expansion period (a reduction in the predicted probability of 9 per cent); he requires a higher income of \$86,964 per annum (\$7,247 per month) and deposit of \$51,878 to achieve a similar loan level.

It is particularly apparent in the GFC data that the borrower characteristics which previously influenced the chosen mortgage product in favour of the SFRM are no longer as effective. During the credit expansion period, young applicants, with young dependents and high debt-servicing ratios had a high probability of selecting a SFRM. During the period of crisis the borrowers accessing SFRM products appear to be more financially experienced borrowers – professionals or managers, with a co-borrower, who have been clients of the bank for a longer period. In addition, first-time home buyers who are eligible for the boosted government grant incentives during 2008, are prone to selecting SFRM products. While our model predicts that borrowers should have increasingly preferred SFRMs during the GFC period, we observe that applications for SFRMs decreased considerably.

A number of borrower characteristics which significantly influenced the mortgage product choice of the applicant during the pre-crisis period play an insignificant role in mortgage choice during the crisis period. These include the risks associated with being self-employed, the level of liquid assets, expenditures, and marital status. Prior to the crisis, self-employed applicants preferred flexible VRMs which allow them to make larger repayments during periods of good income stream. However, during the crisis, self-employed applicants are no longer statistically separable from employed applicants. While the income risk (and potential default risk) of self-employment was separately recognised in the application process during the credit expansion, during the crisis both the benchmark applicant and self-employed borrowers were less likely to obtain VRMs. Similarly, where household income risk is managed in the pre-GFC period by a potential extra household income stream via the presence of a spouse in the application, this resulted in greater access to more flexible mortgage products. During the crisis, however, marital status, the level of liquid assets and the expenditure patterns of the household lose their explanatory power. They can no longer be used to drive the selection of the mortgage product towards the household characteristics.

A number of borrower characteristics which significantly influenced the mortgage product choice of the applicant during the pre-crisis period, play an insignificant role in mortgage choice during the crisis period.

To increase the probability of accessing VRM products after September 2008, applicants require greater income and wealth than pre-crisis, as well as higher expected house price appreciation and a strong mobility motive. During this crisis period, borrowers younger than 40 are more likely to take VRMs, while during the credit expansion period VRMs were more probable for borrowers over 50 years old. (During the credit expansion younger borrowers take SFRMs and older borrowers prefer VRMs, however, during the crisis younger borrowers select VRMs and older borrowers opt for HMs.)

During the credit-expansion period there was a substantial house price appreciation in the Australian market, and expectations around future equity gain had a significant effect on the extent to which applicants were willing to absorb risk in order to access these potential gains. This plays out in the data as an increased probability of VRM products, where the applicant manages a high LTV with variable payments, but anticipates strong capital gains in the shorter term. The expectation of higher housing prices is reflected in the significance of the change in the Melbourne Institute Dwelling Index in the pre-GFC period, which positively influences the probability of VRM products. However, this effect shifts towards a preference for HMs during the GFC.

While the overall probability of taking a VRM decreased during the crisis, and SFRMs were hard to access or least preferred during this period, 'honeymoon' products (HMs) experienced a sudden increasing popularity. HMs have traditionally served income or wealth constrained borrowers entering the housing market in Australia, however, during the GFC period they became an increasingly preferred option for a broader group of borrowers. Older borrowers and particularly mobile borrowers, who preferred VRMs in the previous period, select the initial discounts on HMs during the uncertain crisis environment. The main reason for an increase in HM applications lies in cost incentives, as the discount on HMs increased while interest rates were falling.

Conclusion

The results presented in this natural experiment of a change in the cost of funds provide mixed evidence as to the way in which mortgage product choices change. As conditions change, we are able to compare the outcomes for borrowers with the same characteristics. We find that the marginal impact of borrower characteristics on mortgage product application outcomes alter significantly.

During the crisis period, however, some of these formerly significant effects are altered in a way which suggests that these risks are transferred to the borrower at a discounted price; borrowers taking HMs are bearing the interest rate risk in a variable-rate contract, while also facing early repayment limitations. These products become increasingly popular and more accessible, offering higher discounts on the variable interest rate. In addition, the terms on mortgages change, and relatively low-risk applicants choose both VRMs and FRMs during the crisis.

In the pre-crisis period, borrowers accessed products which were generally consistent with their theoretical preferences in order to manage income, mobility and wealth risk as revealed by their borrower characteristics. Although mortgage cost variables, particularly the spread between mortgage product interest rates, dominate the probability of selecting between contracts, there is plentiful evidence that borrower characteristics play a significant role in modifying their behaviour. During the crisis period, however, some of these formerly significant effects are altered in a way which suggests that these risks are transferred to the borrower at a discounted price; borrowers taking HMs are bearing the interest rate risk in a variable-rate contract, while also facing early repayment limitations. These products become increasingly popular and more accessible, offering higher discounts on the variable interest rate. In addition, the terms on mortgages change, and relatively low-risk applicants choose both VRMs and FRMs during the crisis.

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Notes

1. See RBA, *Statistical Tables*, B21 Household Finances. The housing debt-to-disposable income ratio stabilised at around 130 per cent in 2006.
2. Policy makers reacted to the impact of the GFC with a fiscal stimulus (Economic Security Strategy) in October 2008, which involved a direct one-off payment to encourage consumption expenditure, first home buyers grant schemes, and infrastructure investment. This was followed by the Nation Building and Jobs Plan stimulus package in February 2009. Also, in October 2008, the Australian Government offered deposit insurance through the Financial Claims Scheme and the Guarantee Scheme.
3. See ABS, Housing Finance Commitments, 5609.01. Total housing finance commitments reached its highest peak at 69,550 (\$16,879,396,000) in May 2007, after which the value and number of housing finance commitments decreased until after the effects of the fiscal and monetary stimulation policies.
4. ABS, *Housing Finance Commitments*, 5609.03.
5. See Jang and Sheridan (2012) and APRA (2012).
6. RBA, *Statistical Tables*, F1 Interest Rates and Yields, and F5 Indicators Lending Rates.

7. ABS, *Housing Finance Commitments*, 5609.09a.
8. RBA, Box B: Developments in the Low-doc Loan Market, *Financial Stability Review*, September 2005, <http://www.rba.gov.au/publications/fsr/2005/sep/html/box-b.html>.
9. Stewart et al. (2013) argue that actual rates paid by borrowers were declining during this period, reflecting discounts offered to new customers in a more competitive environment for lenders.
10. In September 2008, the RBA took the first policy rate actions in response to the crisis, and the Australian Office of Financial Management (AOFM) took decisions to support RMBS by purchasing \$A8 billion in RMBS. In October 2008, the government released a fiscal stimulus package to support the economy (Economic Security Strategy) and also offered deposit guarantees. Sensitivity analyses to exogenously determined break points for August 2007 and February 2008 do not substantially alter the results presented here.
11. Long-term wholesale debt became more accessible with the support from the Guarantee Scheme.
12. Between July 2007 and early 2009 the securitisation market in Australia was practically inactive.
13. ABS, *Housing Finance Commitments*, 5609.09a.
14. RBA, *Statistical Tables*, F1 Interest Rates and Yields, and F5 Indicators Lending Rates.
15. ABS, *Housing Finance Commitments*, 5609.03.
16. See Dungey et al. (2011) and Wood et al. (2003) for an overview on government net assistance to first home buyers.
17. ABS, *Housing Finance Commitments*, 5609.03.
18. We calculate a multinomial Logit model (MNL) to predict the probability of observing a SFRM and a HM relative to the base of a VRM. We follow a similar approach to the one in Dungey et al. (2014).

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